Exam : Quiz 1
Subject : MLT
Total Marks : 50.00
QP : 2024 Oct27: IIT M AN EXAM QDD2

Exam Mode | Practice Mode

QUESTION MENU

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16

TIMER

00:05

CONTROLS

SUBMIT EXAM

Your Score
0.00 / 50.00
(0%)

Question 1 : 640653995436 Total Mark : 0.00 | Type : MCQ

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL : MACHINE LEARNING TECHNIQUES (COMPUTER BASED EXAM)" ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT? CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN. (IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

OPTIONS :

◯ YES

◯ NO

Your score : 0

Question 2 : 640653995442 View Solutions (0) Total Mark : 4.00 | Type : MCQ

Let $\mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ and $\mathbf{y} = \begin{bmatrix} y_1 \\ y_2 \end{bmatrix}$ be vectors in $\mathbb{R}^2$. Define the functions k_1 and k_2 as:

$$k_1(\mathbf{x}, \mathbf{y}) = x_1y_1 + x_2y_2 + (x_1 + x_2)(y_1 + y_2)$$
$$k_2(\mathbf{x}, \mathbf{y}) = x_1y_1 + x_2y_2 + (x_1^2 + y_2^2) + 3$$

Which of the following statements is true?

OPTIONS :

- ○ Both k_1 and k_2 are valid kernels.
- ○ k_1 is a valid kernel, but k_2 is not a valid kernel.
- ○ k_2 is a valid kernel, but k_1 is not a valid kernel.
- ○ Neither k_1 nor k_2 is a valid kernel.

Your score : 0

Question 3 : 640653995444 View Solutions (0) Total Mark : 4.00 | Type : MCQ

Consider the following kernel:

$$k : R^2 \times R^2 \to R$$
$$k(x, y) = (x^T y)^2 + 1$$

Which of the following transformation mapping ϕ may correspond to the kernel k?

OPTIONS :

- ◯ $\phi([x_1, x_2]^T) = [x_1^2, \sqrt{2}x_1x_2, x_2^2, 1]^T$
- ◯ $\phi([x_1, x_2]^T) = [x_1^2, x_1 + x_2, x_2^2, 1]^T$
- ◯ $\phi([x_1, x_2]^T) = [x_1, \sqrt{2}x_1^2x_2^2, x_2, 1]^T$
- ◯ $\phi([x_1, x_2]^T) = [x_1, x_1x_2, x_2, 1]^T$

Your score : 0

Question 4 : 640653995443 View Solutions (0) Total Mark : 3.00 | Type : MCQ

Given n data points in a d-dimensional space with a non-linear relationship, we apply kernel PCA to reduce the dimensionality and select the first k principal components. Is it possible for k to be greater than d?

OPTIONS :

- ◯ yes
- ◯ No

Your score : 0

Question 5 : 640653995440 View Solutions (0) Total Mark : 4.00 | Type : MSQ

Which of the following expressions is the reconstruction error for a dataset of n points, with respect to a line passing through the origin represented by the vector $\mathbf{w}$. Note that $||\mathbf{w}|| = 1$.

OPTIONS :

- ☐ $\frac{1}{n}\sum_{i=1}^{n} ||\mathbf{x}_i - (\mathbf{x}_i^T\mathbf{w})\mathbf{w}||^2$

- [ ] $\frac{1}{n}\sum_{i=1}^{n}\left[\mathbf{x}_i-(\mathbf{x}_i^T\mathbf{w})\mathbf{w}\right]^T\left[\mathbf{x}_i-(\mathbf{x}_i^T\mathbf{w})\mathbf{w}\right]$
- [ ] $\frac{1}{n}\sum_{i=1}^{n}\left[\mathbf{x}_i^T\mathbf{x}_i \mid (\mathbf{x}_i^T\mathbf{w})^2\right]$
- [ ] $-\frac{1}{n}\sum_{i=1}^{n}(\mathbf{x}_i^T\mathbf{w})^2$

Your score : 0

Question 6 : 640653995449 View Solutions (0) Total Mark : 5.00 | Type : MSQ

Let $X_1, X_2, \ldots, X_n$ be n i.i.d. samples with parameter θ, which follows one of the following PDFs:

For $\theta = -1$, we have

$$f(x \mid \theta) = \begin{cases} 5x^4, & \text{if } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}.$$

For $\theta = 1$, we have

$$f(x \mid \theta) = \begin{cases} 1, & \text{if } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}.$$

Suppose we wish to find the maximum likelihood estimate of θ, then which among the following are true?

OPTIONS :

- [ ] If $\prod_{i=1}^{n} 5x_i^4 < 1$, then $\hat{\theta}_{MLE} = 1$
- [ ] If $\prod_{i=1}^{n} 5x_i^4 > 1$, then $\hat{\theta}_{MLE} = 1$
- [ ] If $\prod_{i=1}^{n} 5x_i^4 < 1$, then $\hat{\theta}_{MLE} = -1$

$i=1$

☐ If $\prod_{i=1}^{n} 5x_i^4 > 1$, then $\hat{\theta}_{MLE} = -1$

Your score : 0

Question 7 : 640653995441 View Solutions (0) Total Mark : 3.00 | Type : SA

The eigenvalues of the covariance matrix of a centered dataset in $\mathbb{R}^5$ are $30, 10, 10, 0, 0$. Standard PCA is performed on this dataset. What is the variance captured by the top two principal components expressed as a percentage of total variance?

Answer (Numeric):

Answer

Accepted Answer : 80

Your score : 0

Question 8 : 640653995448 View Solutions (0) Total Mark : 5.00 | Type : SA

Consider the following data points for k-means clustering.

$$(-1, 0), (-1, 1), (-1, -1), (2, 0), (3, 1), (3, -1), (4, 0)$$

In the initialization step of k-means with k = 2, suppose $\mu_1^0 = (-1, 0)$ and $\mu_2^0 = (2, 0)$. Distances of datapoints from initial cluster means is tabulated below:

x_i	$\|x_i - \mu_1^0\|_2^2$	$\|x_i - \mu_2^0\|_2^2$
$(-1, 0)$	0	3
$(-1, 1)$	1	10
$(-1, -1)$	1	10
$(2, 0)$	3	0
$(3, 1)$	17	2
$(3, -1)$	17	2

$(4, 0)$	5	2

As per these cluster centers, the data points are then assigned to either cluster 1 or cluster 2. After this assignment, what will be the value of the objective function?
Note: Objective function is given by

$$F(z_1, z_2, \ldots, z_n) = \sum_{i=1}^{n} \|x_i - \mu_{z_i}\|_2^2$$

Answer (Numeric):

Answer

Accepted Answer : 6

Your score : 0

Question 9 : 640653995450 View Solutions (0) Total Mark : 4.00 | Type : SA

Consider a GMM for 5 points:

$$x_1 = 1, x_2 = 1.2, x_3 = 2, x_4 = 1.5, x_5 = 0.5$$

At some time-step in the EM algorithm, following are the values of λ_k^i for the k-th mixture after the E-step:

$$\lambda_k^1 = 0.3, \lambda_k^2 = 0.1, \lambda_k^3 = 2.5, \lambda_k^4 = 0.6, \lambda_k^5 = 0.8$$

What is the estimate of μ_k after the M-step? Enter your answer correct to two decimal places.

Answer (Numeric):

Answer

Accepted Answer : 1.50 to 1.60

Your score : 0

Question 10 : 640653995451 View Solutions (0) Total Mark : 4.00 | Type : SA

Consider a dataset with 100 total data points. Each data point is classified as either type A or type B. We model this using a Bernoulli distribution, where p is the probability of a data point being type A. If the maximum likelihood estimate (MLE) of p based on the dataset is 0.4, how many data points of type B are there in this dataset?

Answer (Numeric):

Answer

Accepted Answer : 60

Your score : 0

Question 11 : 640653995437

Total Mark : 0.00 | Type : COMPREHENSION

Given the vector $\mathbf{x} = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$ and the line passing through the origin represented by the vector $\mathbf{w} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.

Answer the given subquestions.

Your score : 0

Question 12 : 640653995438

View Parent QN | View Solutions (0)

Total Mark : 3.00 | Type : SA

Find the length of the projection of $\mathbf{x}$ onto the line defined by $\mathbf{w}$.
Enter your answer correct to two decimal places.

Answer (Numeric):

Answer

Accepted Answer : 4.8 to 5.1

Your score : 0

Question 13 : 640653995439

View Parent QN | View Solutions (0)

Total Mark : 4.00 | Type : SA

Calculate the magnitude(norm) of reconstruction error after projecting x onto the line defined by w.
Enter your answer correct to two decimal places.

Answer (Numeric):

Answer

Accepted Answer : 0.5 to 0.9

Your score : 0

Question 14 : 640653995445

Total Mark : 0.00 | Type : COMPREHENSION

Based on the above data, answer the given subquestions.

A k-means++ algorithm with k = 3 is applied on the following 2D points:

$$(0,1),(1,0),(1,2),(2,1),(2,3),(2,4),(3,2)$$

First cluster mean μ_1^0 is chosen as (2, 1).
Suppose the point with the highest score is chosen as the 2nd cluster mean μ_2^0.

Your score : 0

Question 15 :
640653995446

View Parent QN | View Solutions (0)

Total Mark : 3.00 | Type : MCQ

What is μ_2^0? Use squared distance to calculate the scores.

OPTIONS :

- ◯ (0,1)
- ◯ (2,3)
- ◯ (3,2)
- ◯ (2,4)

Your score : 0

Question 16 :
640653995447

View Parent QN | View Solutions (0)

Total Mark : 4.00 | Type : MCQ

Which point has the lowest probability of being chosen as the 3rd cluster mean? Use squared distance to calculate the scores.

OPTIONS :

- ◯ (1,0)
- ◯ (2,3)
- ◯ (3,2)
- ◯ (1,2)

Your score : 0

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